

REMARKS

CLAIM REJECTIONS

Claims 224, 232, 239: The Examiner rejects claims 224, 232, and 239 under 35 U.S.C. §103(a) as obvious in view of US Patent 4,256,922 to Görke (“Görke”), US Patent 4,399,328 to Franssen et al. (“Franssen”), and US Patent 5,870,484 to Greenberger (“Greenberger”).

Claim 224 recites, in pertinent part:

... **providing, in one enclosure, an array of at least 6 output transducers** distal from said positions in space; ...

... obtaining, in respect of each transducer, **a delayed replica of each input signal** delayed by a respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space such that **replicas for transducers closer to the respective position in space are delayed more than replicas for transducers further from the position in space** such that the sound waves of the channel are directed towards the position in space in respect of that channel; ...
[Emphasis added]

Claims 232 and 239 recite, in pertinent part:

... **an array of at least 6 output transducers in a single enclosure** distal from said positions in space; ...

... replication and delay means arranged to obtain, in respect of each transducer, **a delayed replica of the input signal** delayed by a respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space such that **replicas for transducers closer to the respective position in space are delayed more than replicas for transducers further from the position in space** such that the sound waves of the channel are directed towards the position in space in respect of that input signal; ... [Emphasis added]

FRANSSEN AND GREENBERGER

The Examiner cites Franssen because Greenberger fails to disclose **an array of at least 6 output transducers**.

The system disclosed in Greenberger works on the principle of transmitting a non-delayed and non-inverted signal very close to a delayed and inverted signal to obtain a cardioid radiation pattern. This was discussed in the Examiner phone interview of September 9, 2008 and in our Office Action Response of September 16, 2008. The sound wave produced will travel in the direction from the inverted and delayed signal towards the non-inverted and non-delayed signal. This cardioid radiation pattern is intimately connected to the use of two transducers. Greenberger discloses no way of obtaining a cardioid pattern using **at least 6 output transducers**. There is no obvious way to add further transducers to the system disclosed in Greenberger to produce the same radiation pattern. In particular, a person having ordinary skill in the art at the time of the invention would not know where to put any further transducers and would not know whether to delay and/or invert the signal routed to such extra transducers. Again, this is because the system disclosed in Greenberger relies on the very specific phenomenon of a cardioid radiation pattern that can only be achieved by using TWO output transducers. To say that further transducers would arbitrarily be added is an *ex post facto* analysis and does not accord with what a person having ordinary skill in the art at the time of the invention would deem technically feasible.

The Examiner states that in order to provide greater directionality, a person having ordinary skill in the art at the time of the invention would extend the number of elements in the array of Greenberger in view of Franssen. The Examiner states that Franssen discloses a stereophonic speaker system wherein an array of at least six output transducers in one enclosure are supplied with an input signal that is delayed to provide a directional acoustic output. This analysis of Franssen is incorrect.

The system of Franssen is designed so that the sound emitted by the array of speakers has a SPHERICAL directivity pattern (that is independent of frequency and direction) similar to that of a single speaker (column 6, lines 24-33). This is achieved by adjusting the AMPLITUDE of the input signal 7, using amplitude control devices 11 to 15, to supply transducers 1 to 5 with signals that satisfy a specified equation (column 1, line 63 to column 2, line 11). Franssen does NOT teach DELAYING an input signal to provide DIRECTIONAL acoustic output, as stated by the Examiner. By contrast, see claims 224, 232, and 239 reciting **“replicas for transducers closer to the respective position in space are DELAYED more than replicas for transducers further from the position in space such that the sound waves of the channel are DIRECTED towards the position in space in respect of that channel”** [EMPHASIS added]. In fact, it is the intention of Franssen to provide a speaker system that provides a UNIFORM (i.e. non-directional) sound pattern from the array irrespective of the listening position of the user and NOT a sound pattern that is directional. See Franssen at col. 6, lines 24-33, stating that “It is then assumed that the individual transducers have a spherical

directivity pattern. In practice a directivity pattern for the arrangement can be obtained which, in the optimum case, is identical to the directivity patterns of the individual transducers." Thus, Franssen does NOT disclose greater directionality but rather teaches avoiding directionality. A person having ordinary skill in the art at the time of the invention would not therefore have referred to Franssen to achieve greater directionality than could be achieved with the system disclosed in Greenberger.

Even if, for some reason, a person having ordinary skill in the art at the time of the invention was motivated to modify Greenberger in view of the teaching in Franssen, the claimed embodiments would still not result. Greenberger relies on the cardioid pattern in order to produce directional sound waves and thus requires a first source to provide a non-delayed and non-inverted signal and a second source to provide a delayed and inverted signal. Franssen teaches a method of emitting sound from an array of five, seven or nine transducers so that the sound is emitted in a pattern that is similar to that emitted from a single transducer. Thus, if a person having ordinary skill in the art at the time of the invention were to apply the disclosure of Franssen to Greenberger he would arrive at a system where a first array of five, seven or nine transducers provides the non-inverted and non-delayed signal and a second array provides the inverted and delayed signal. The combined system may, for example, provide more powerful sound compared to the system of Greenberger alone, however it would not lead to a system that provides greater directionality. The directionality would be no greater than that achieved by Greenberger. Thus, a person having ordinary skill in the art at the time of the invention would not have a reason to attempt to modify the system disclosed in Greenberger using the disclosure of Franssen. Such a combination would not provide a system that has greater directionality than what the system of Greenberger, alone, would provide.

In view of the above points, a person having ordinary skill in the art at the time of the invention would NOT have been motivated to consider using any aspect of the array of Franssen to modify the system of Greenberger to provide greater directionality. Again, this is because Greenberger teaches away from using more than two transducers and Franssen teaches away from directionality.

GÖRIKE AND GREENBERGER

The Examiner states that Greenberger does not disclose an apparatus wherein the **replicas for transducers closer to the respective position in space are delayed more than replicas for transducers further from the position in space**. The Examiner then states that Görke discloses "wherein an array of output transducers causes a plurality of input signals to appear to emanate from respective different positions in space such that signals for transducers closer to the respective position in space are delayed more than replicas for transducers further from the position in space."

As stated in column 1, line 59 to column 2, line 36 of Görke, the sounds from the speakers

are reflected off the walls of a room to create the impression of an enlargement of the base of the acoustic event. This is achieved by POSITIONING two of the speakers so that they point in the direction of the walls of the room. Column 2, lines 18-30 state that by artificially delaying these signals, in addition to the inherent delay due to the increased distance the sound wave has to travel, it is possible to enlarge the auditory panorama as it would seem to the user that sound has travelled from a further distance. Thus the delay is introduced to reproduce the effect of the sound event occurring in a large room, such as a large concert hall (column 7, lines 49-68). Thus the delays of Görripe play no part in DIRECTING the sound, but merely in creating the effect of a large room. Again, sound is directed in Görripe by POSITIONING the speakers so that they point towards the respective position.

The Examiner states that the system of Greenberger would be modified such that the delay methods of Görripe would be applied in order to control the spatial sound reproduction with respect to the position of the array in a surrounding environment and that the motivation for doing so would be to account for the placement of the array in a non-symmetrical relationship with respect to the reflection walls of a room. If the system of Greenberger was placed in an asymmetric room and, in view of Görripe, a person having ordinary skill in the art at the time of the invention introduced delays in order to overcome the problems of asymmetry, then the claimed embodiments would still not result.

In order to direct sound waves using the system disclosed in Greenberger, output from both left and right transducers are required. For example, directing sound to the left requires a non-inverted and non-delayed signal to be sent to the left transducer (see, for example, Figure 13A of Greenberger) and an inverted and delayed signal to be sent to the right transducer. Thus if the system of Greenberger was placed in an asymmetric room, and in view of Görripe, in order to delay a signal that is directed left, to overcome any asymmetry, the non-inverted and non-delayed signal AND the inverted and delayed signal supplied to the left and right transducers respectively would have to be delayed by an EQUAL amount. Adding an equal delay to the non-inverted and non-delayed signal and the inverted and delayed signal would still result in the right transducer being delayed more than the left transducer for sound that is directed left. The system of Greenberger combined with Görripe therefore does NOT lead to replicas for transducers closer to the respective position in space that are **MORE** delayed than replicas for transducers **FURTHER** from the position in space, as presently claimed.

FRANSSEN, GÖRIKE, AND GREENBERGER

If, *arguendo*, a person having ordinary skill in the art at the time of the invention modified the abovementioned system of Greenberger and Görripe to include the teaching of Franssen, the claimed invention would still not result. If a person having ordinary skill in the art at the time of the invention were to apply the teaching of Franssen to Greenberger and Görripe (which he would not) then an array of five, seven or nine transducers would be used for each one of the left and right channels. However, there is still no motivation in any of the cited prior art documents for a person having ordinary skill in the art at the

time of the invention to modify Greenberger to delay **replicas for transducers closer to the respective position in space more than replicas for transducers further from the position in space**. Any suggestion that a person having ordinary skill in the art at the time of the invention would make such a modification would be an *ex-post facto* analysis that would not reflect what would be obvious to a person having ordinary skill in the art AT THE TIME OF THE INVENTION.

In view of the fact that neither Greenberger nor Görke nor Franssen disclose **replicas for transducers closer to the respective position in space that are more delayed than replicas for transducers further from the position in space** in order to direct the sound waves, the present claims should be deemed to define novel and non-obvious subject-matter. No combination of Greenberger, Görke, and/or Franssen would lead to a system falling within claims 224, 232, and 239 of this application. Correspondingly, Applicant submits that claims 224, 232, and 239 are novel and non-obvious in view of the prior art, and should be allowed.

Claims 225 – 231, 233 – 238, and 240-242: The Examiner also rejects claims 225 – 231, 233 – 238, and 240-242 under 35 U.S.C. §103(a) as obvious in view of Franssen, Greenberger, and Görke. However, given that these claims depend from claims 224, 232, and 239, which Applicant has shown to be patentable over the prior art, Applicant submits that these claims should also be allowed.

CONCLUSION

Applicant believes this to be a complete response to the December 9, 2008 Final Office Action. For the reasons expressed above, Applicant submits that all of the pending claims are patentable over the cited prior art and respectfully requests the Examiner to allow the claims.

Respectfully submitted:

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